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Procedia Environmental Sciences 13 (2012) 2362 – 2373

Procedia

Environmental Sciences

The 18th Biennial Conference of the International Society for Ecological Modeling

Assessment of Management Effectiveness for the National Nature Reserve in the Yellow River Delta

W.J. He, B.S. Cui*, Y.Y. Hua, X.Y. Fan

*School of Environment, Beijing Normal University, State Key Joint Laboratory of Environmental Simulation and Pollution Control,
No. 19 Xijiekouwai Street, Beijing 100875, China.*

Abstract

Assessing the effectiveness of management of protected areas is critical to understanding and improving management, to improving the level of management and to achieving management targets. Based on the World Commission on Protected Areas (WCPA) of the IUCN framework for assessing management effectiveness of protected areas and protected area systems, this paper establishes a comprehensive evaluation index system that conforms to the given management objectives. The assessment of the management situation for The national protected area in the Yellow River Delta comprises four aspects: management base, mechanism, behavior and effectiveness. And we put forward, as well, corresponding management suggestions. Assessment results indicate that the management situation is fine in the national protected area in the Yellow River Delta. However, further actions need to be taken in terms of reserve control and coordinated development between reserve and community due to existing oil deposits and some construction engineering involving the Yellow River.

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Keywords: Yellow River Delta; Nature reserves; Management effectiveness; Assessment indicator

1. Introduction

A nature reserve is a specific natural area that is protected by the government and the people and is the basis for the national strategy to protect biodiversity [1, 2]. However, because establishing a nature reserve is only the first step toward achieving its important goal, to protect world biodiversity, effective

* Corresponding author. Tel: +86-13911484846; fax: +86-010-58802079
E-mail address: cuibs@bnu.edu.cn

management of the nature reserve can result in its performance of the that role and in higher value [3-5]. Nature reserve management has always been the focal point of the usual effort in protected areas, but it also involves the crossover problems of ecology, management, sociology and economics science [6]. Further, the quality of nature reserve management is one of the important reserve management indexes for evaluating the capacity of protected areas and mainly involves the amount of reserve management work done [7, 8]. At present, as many countries are paying attention to the evaluation of management effectiveness of nature reserves [9], China is faced with various influences on the further development of national nature reserves, which were established as protected areas following the policies of "Plan early establish early," "Choose early and establish more protected areas," and "Save nature step-by-step," with complete protection being the main goal from the start [10, 11]. Assessing the management effectiveness of nature reserves is an effective way to verify protection performance in the same way we can determine the questions for management and then put forward solutions. Given solutions, it is then easy to improve construction quality and management standards for protected areas [12]. Generally speaking, assessing management effectiveness is indispensable to doing periodic comprehensive evaluations of nature reserves in terms of sustainable development, formulating protection policy and scientifically managing national protected areas.

2. Study area

The Yellow River Delta Nature Reserve (37°35'–38°12' N, 118°33'–119°20' E) is located in the estuary of the Yellow River, in Dongying City, Shandong Province, China (Figure 1). It has a warm, temperate, continental monsoon climate with distinctive seasons and a rainy summertime. The area, comprising perennially waterlogged wetlands, including rivers, lakes, estuary waters, pits and ponds, reservoirs, channels, salt lakes, shrimp and crab pools and tidal flats, is 964.8 km², or 63.06 % of the total area of the Yellow River Delta. This nature reserve was established mainly to protect the Yellow River wetlands ecosystem and rare and endangered birds. In December 1990, the Dongying Municipal Government approved the establishment of the Yellow River Delta Municipal Nature Reserve; it was then upgraded to the Provincial level in November 1991; and it was again upgraded, to the National level, in October 1992. In December 1992, the Shandong Yellow River Delta National Nature Reserve District Authority was established, comprising the Huanghekou, Dawenliu and Yiqianer management stations.

Since the establishment of nature reserves in China, the Yellow River Delta Reserve (?) has played an important role in the protection of new wetlands ecosystems and rare and endangered bird species. In 1993 it was approved by the Chinese MAB National Committee for participation in "the Chinese people and the Network of Biosphere Reserves;" then it was added to the "East Asia - Australia Shorebird reserve network," approved by the Wetlands International organization-Asia-Pacific, and in 1996 becoming one of the first 19 international members. It was approved for inclusion in the "Northeast Asia crane protected area network" in 1997, one of the first 16 international members. In 2000 it was named "National ecological education base for action to protect the Mother River" by eight ministries and commissions, including the Central Committee and State Forestry Administration. In 2002 it was named a National Nature Reserve advanced group by the State Forestry Administration, in 2005 named one of China's six most beautiful wetlands, and in 2006 was approved by the State Forestry Administration as a national demonstration nature reserve.

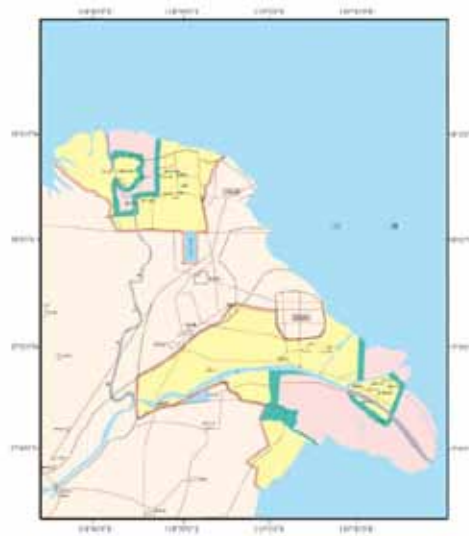


Fig.1 Map of the national nature reserve in the Yellow River Delta

3. Evaluation method and index system

At present, many countries, regions and organizations have conducted theoretical research and undertaken practical application in the area of nature reserves, in accordance with different purposes, objectives and application levels of evaluation. They have established different evaluation systems and use different evaluation methods to assess the management effectiveness of protected areas. Likewise, China has undertaken some management effectiveness evaluations of protected areas, and to a degree the results point to the threats to protected areas and point to management issues.

Nature reserve management effectiveness evaluation involves routine management processes for protected areas. Based on the six standard elements of protected area management [13, 14], the World Commission on Protected Areas (WCPA) has proposed a protected area management effectiveness evaluation framework (Table 1) that itemizes the various elements of a basic evaluation.

Table 1. Framework of World Commission on Protected Areas for assessing management effectiveness of national protected areas

Focus	Elements	Criteria
Design issue	Context	Significance; threats; vulnerability; national context
	Planning	Protected area legislation and policy; protected area system design; reserve design; management planning
Appropriateness of management systems and processes	Input	Resourcing of agency; resourcing of site; partners
	Process	Suitability of management processes
Delivery of protected area objectives	Output	Results of management actions; services and products
	Outcomes	Impacts: effects of management in relation to objectives

3.1. Index system for management effectiveness evaluation

We used the WCPA evaluation framework to establish management and impact evaluation indicators for the Yellow River Delta National Nature Reserve (Table 2) and to evaluate the management effectiveness of the Yellow River Delta National Nature Reserve from four perspectives: management base, management mechanisms, management behavior and management effectiveness [2, 5]. Management base focuses on the condition and status of agencies, staffs, budget, equipment and facilities in a reserve; management mechanisms focuses on the formulation of management regulations, management plans and management objectives and the allocation of charges in a reserve, and on the coordinative manner and mechanism between the reserve and local residents, neighboring residents and communities and other relevant agencies, departments and enterprises, among others; management behavior focuses on the activities launched by reserve staff to realize protective objectives and reserve functions, *e.g.*, reserve planning, boundary determination, patrolling, staff training, resource surveying and the working status of scientific research and monitoring, among others; management effectiveness focuses on the status of protection targets, the status of resource management and protection in a reserve, and the impact on the neighborhood and on regional economic development, among other things.

Table 2 Evaluation indicator system for management capacity and effectiveness of the National Nature Reserves in the Yellow River Delta

Assessment aspect	Assessment indicators
Management base	Management agency
	Infrastructure
	Management budget
	Staff quality and number
	Salary and benefits
Management mechanism	Regulations (rules)
	System of management、monitoring and evaluation
	Administrative law-enforcing authorization
	Personnel management
	Community involvement
Management behavior	Master plan
	Resource monitoring and biodiversity investigation
	Education awareness and community co-management
	Tourism management
	Patrol(?) in reserve (is this security checks??)
Management effectiveness	Condition assessment
	Reserve control (WHAT??)
	Coordinated development efforts between reserve and community
Additional points	Reserve has presided over research projects independently; moreover, some are in process now
	There have been no forest / grassland fires in last 3 years in

	the Reserve; no species were introduced into the Reserve in last 3 years
	There have been international exchange projects in the last 3 years
	There are complete facilities in the Reserve, like hotels and restaurants, that provide tourists with conveniences
	There are active programs for the restoration of degraded areas within the protected area and/or the protected area buffer zone

3.2. Evaluation grades

According to domestic and international expert opinion and the experience of protected area management and evaluations, and according to the mutual argument of field research and studies, reserve management evaluation results in four grades, A, B, C and D, each representing the state of management in a particular area. Assessment results and grades for the Yellow River Delta Reserve are in Table 3, Table 4, Table 5, Table 6 and Table 7.

Table 3 Management base capacity assessment level of the National Nature Reserve in the Yellow River Delta

Assessment indicators	Grade descriptors	Assessment results
Management agency	A Complete protected area management agencies, non-redundant, coordination between various departments, high efficiency	B
	B Complete protected area management agencies, non-redundant, essential coordination between the various departments' work, good efficiency	
	C Basic integrity of protected area management agencies, redundant departments, and coordination between departments is not obvious, only generally efficient	
	D Protected area management institutions are not complete, redundancy, lack of coordination of work between departments, low efficiency	
Infrastructure	A Impeccable infrastructure in protected areas, timely maintenance and repair	B
	B Basically sound infrastructure in protected areas, basic maintenance and repair	
	C Poor infrastructure in protected areas, apparent abandoned facilities, no people to manage facilities	
	D A serious lack of infrastructure in protected areas, waste facilities, lack of management	
Management budget	A A dedicated office and staff manage research and management funds, and there is a reasonable fund management system	A
	B There are people managing research and management funds but no specific office	
	C There are people managing research and management funds, but there is often financial chaos	
	D Funds are poorly managed	
Staff quality and number	A All of the protected area staff have bachelor's degrees, are of high quality, have professional skills and management training; there are enough employees to do the work; there are no redundant employees	B
	B Most of the protected area staff have Bachelor's degrees, are of high quality, occasionally have professional skills and management training; there are enough employees to do the	

	work; there are redundant employees	
	C Some of the protected area staff have Bachelor's degrees, are of basic quality, seldom have professional skills and management training; there are many redundant employees	
	D No staff have a Bachelor's degree; staff is of low quality and has never received professional skill and management training; the staff does nothing	
Salary and benefits	A Wages are in line with national standards and are paid on time, not in arrears, there is good welfare	B
	B Wages are in line with national standards and are paid on time, not in arrears, acceptable(?) welfare	
	C Wages are in line with national standards and paid on time, not in arrears; there is some welfare	
	D Wages are in line with national standards and paid on time, not in arrears; there is no welfare	

Table 4 Management mechanism capacity assessment level of the National Nature Reserve in the Yellow River Delta

Assessment indicators	Grade descriptors	Assessment results
Regulations (rules)	A There is a clear introduction to the protected area management approach	B
	B There is a basically clear introduction to the protected area management approach	
	C There is an unclear introduction (?) to the protected area management approach	
	D There is no introduction to the (?) protected area management approach	
System of management, monitoring and evaluation	A There are complete protected area management, monitoring and evaluation systems, the management implementation process complies with standard regulations, there is a high degree of coordination between departments, and management efficiency	B
	B There are complete protected area management, monitoring and evaluation systems, the management implementation process complies with standard regulations, there is a good degree of coordination between departments, and management efficiency	
	C The protected area management, monitoring and evaluation systems have faults or redundancies, there are incomplete departmental regulations, there is only general efficiency of management	
	D The protected area management, monitoring and evaluation systems are seriously imperfect; there are no basic regulations and a poor degree of coordination between departments; management efficiency is poor	
Administrative law enforcement authorization	A There is efficient (effective?) law enforcement, clear enforcement responsibilities, strict law enforcement discipline	B
	B There is effective law enforcement, basic specific enforcement responsibilities, and strict enforcement of basic discipline	
	C There is generally effective law enforcement, generally explicit enforcement responsibilities, and generally strict enforcement of discipline	
	D There is confusion among law enforcement managers and about law enforcement responsibilities and enforcement discipline	
Personnel management	A There are clear incentives and penalties, clear rewards and punishments, clear personnel relationships	B

	B There are basically clear incentives and penalties, basically clear rewards and punishments, basically clear personnel relationships	
	C There are occasional rewards and punishments, lack of a clear management approach, and some confusion in personnel relations	
	D There is departmental confusion and no incentives	
Community involvement	<p>A There is a very good relationship between protected area management and the surrounding communities, no disputes, community residents usually participate in routine management of protected areas.</p> <p>B There is a good relationship between protected area management and the surrounding communities, disputes are seldom, community residents sometimes participate in the routine management of protected areas.</p> <p>C There is only a fair(?) relationship between protected area management and the surrounding communities, there are usually disputes, community residents occasionally participate in routine management of protected areas..</p> <p>D There is a bad relationship between protected area management and the surrounding communities.</p>	C

Table 5 Management behavior capacity assessment level for the National Nature Reserve in the Yellow River Delta

Assessment indicators	Grade descriptors	Assessment results
Master plan	A There is a complete master plan for the protected area and a strong security plan to ensure its smooth implementation	B
	B There is a generally complete master plan for the protected area and plans to ensure its implementation	
	C There is an incomplete master plan and safeguards are weak	
	D There is no master plan	
Resource monitoring and biodiversity investigation	A There is a complete survey and monitoring report on protected area resources and biodiversity, and updates are timely	C
	B There is a generally complete survey and monitoring report on protected area resources and biodiversity and occasional updates	
	C There is an incomplete survey and monitoring report on protected area resources and biodiversity, and there are no updates	
	D There is no survey and monitoring report on protected area resources and biodiversity	
Education awareness and community co-management	A The protected areas are publicized in every way and there are significant results There is a good partnership between the protected area and surrounding community residents, thereby promoting coordinated economic development between ecology and community	C
	B The protected areas are publicized in a general way and get some results There is a loose partnership between the protected area and surrounding community residents, generally promoting coordinated economic development between ecology and community	
	C The protected areas are publicized in only some ways, with little results There is a poor partnership between the protected areas and surrounding community residents	
	D The protected areas are never publicized There is a bad relationship between the protected areas and surrounding community	

	residents	
Tourism management	A There are excellent tourism facilities, tourist routes and travel plans; a lot of tourists are attracted who do not harm the environment	B
	B There are generally good tourism facilities, tourist routes and travel plans; tourists are attracted who do not harm the environment	
	C There are poor tourism facilities, tourist routes and travel plans; few tourists are attracted	
	D There are no tourism facilities.	
Patrol in reserve (?) Security check?	A At least 1-3 times a day	A
	B At least 1-3 times a week	
	C At least 1-3 times a month	
	D 1-3 times a year	

Table 6 Management effectiveness capacity assessment level for the National Nature Reserve in the Yellow River Delta

Assessment indicators	Grade descriptors	Assessment results
Condition assessment	A Timely evaluation of the impact of conservation measures to protect the area	B
	B General evaluation of the impact of conservation measures to protect the area	
	C The impact of conservation measures to protect the area is not clear	
	D There is no evaluation of the impact of conservation measures to protect the area	
Reserve control	A Strict compliance with the regulations of the National Nature Reserve for protected areas to manage and plan	C
	B General compliance with the regulations of the National Nature Reserve for protected areas to manage and plan	
	C Some management and plans do not comply with the regulations of the National Nature Reserve for protected areas	
	D No compliance with the regulations of the National Nature Reserve for protected areas to manage and plan	
Coordinated development between reserve and community	A Harmony with the surrounding community, and common development	B
	B General harmony with the surrounding community, and common development to some degree	
	C Not much coordination with the surrounding community	
	D There is no effort to achieve joint development	

Table 7 Additional points on the National Nature Reserve in the Yellow River Delta

Additional points	The Reserve has presided over research projects independently; moreover, some are in process now	●
	There have been no forest / grassland fires in last 3 years in the Reserve; no species have been introduced into the Reserve in the last 3 years	●

There have been international exchange projects during the last 3 years	○
There are complete facilities in the Reserve, like travel hotels and restaurants that provide tourists with conveniences	●
There are active programs for restoration of degraded areas within the protected area and/or the protected area buffer zone	●

Note: "●" means the point applies; "○" means the point does not apply.

4. Results and discussions

4.1. Assessment of results

Looking at the results of the evaluations for the various aspects of management for the Yellow River Delta Reserve, we find two A grades, twelve B grades, and four C grades, as per the distribution shown below in Figure 2 below.

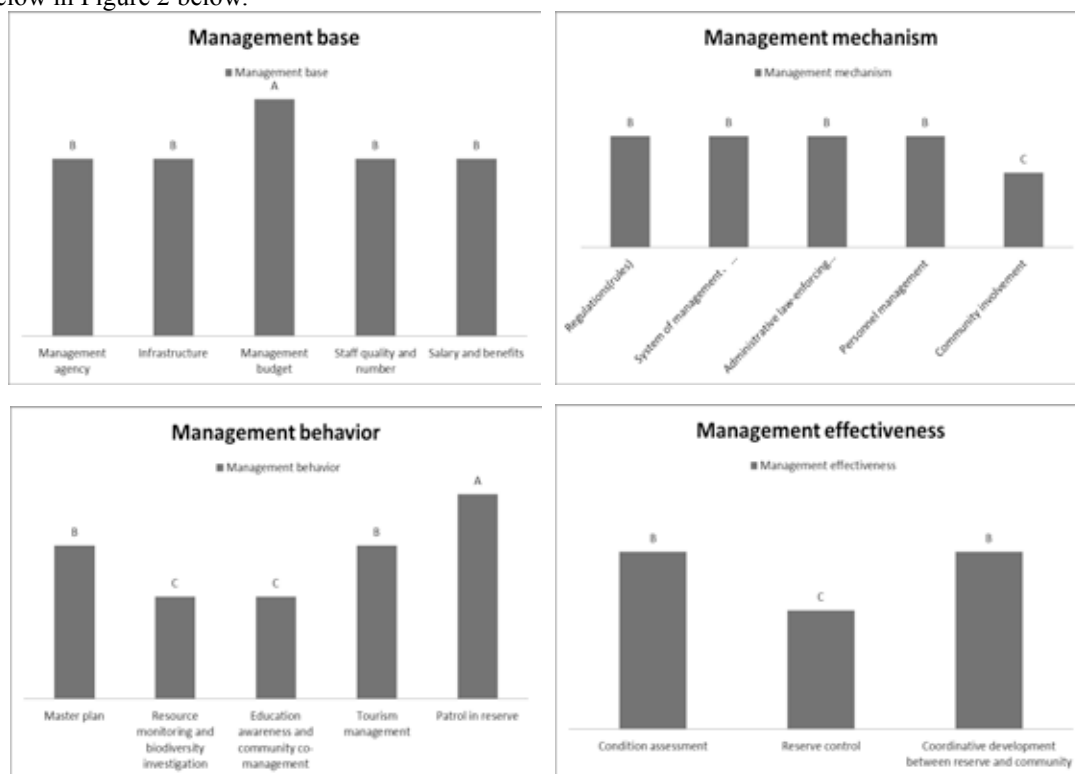


Fig.2 Grade distribution for management of the National Nature Reserve in the Yellow River Delta

Budget management and patrol reserve (what does this phrase mean anyway???) are both graded A; community involvement, resource monitoring, biodiversity investigation, education awareness and community co-management, and reserve control are graded C; the twelve other categories are graded B. Configuring the A, B and C results, as below in Figure 3, we can see that the management of the National Nature Reserve of the Yellow River Delta is basically good.

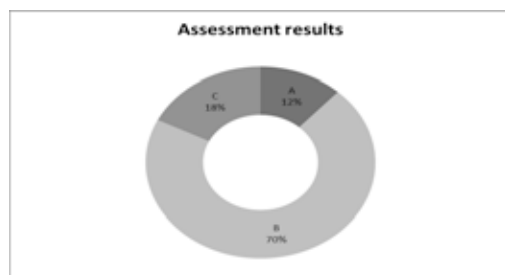


Fig.3 Assessment results for management of the National Nature Reserve of the Yellow River Delta

4.2. Discussion

It can be seen from Figure 2 and Figure 3 that there are no D (the worst) grades. In fact, 82% of the grades are B and above.

The indexes for community involvement, education awareness and community co-management get a C because there are some conflicts(?) between the protected area and the surrounding communities. The establishment of a nature reserve can reduce the local farmers' assets and limit development opportunities, and often the farmers cannot get compensation for this deprivation, and local economic development is constrained. On the other hand, community residents tend to use traditional farming methods and have traditional living habits, and there often appears to be an inefficient use of resources as well as destructive results to those traditions(???) in the process of developing protected areas and surrounding communities, which bring biodiversity and habitat under a lot of pressure. As a result, the management of nature reserves in recent years has become a hot topic. So, how to achieve good community co-management will be the (a?) key point in future management of the National Nature Reserve in the Yellow River Delta.

The other two indexes, for resource monitoring and biodiversity, investigation and reserve control get a C grade due to the conflict between existing function regionalization and existing management regulations for the National Nature Reserve in the Yellow River Delta. The original nature reserve functional regionalization and the 2001 nature reserve adjustment functional regionalization were implemented in order to resolve the contradiction between conservation and oil development. This adjustment of functional regionalization promoted the orderly management of protected areas and community construction and effectively protected the natural resources and nature environment in the protected areas. However, both the original nature reserve functional regionalization and the 2001 nature reserve functional regionalization adjustment emphasized the continuity of functional areas too much, did not fully take into account the extension of the Yellow River and dam reinforcement, river dredging, construction, and the rescue of other protected areas, patrol checks, wetland restoration and other practical needs. In the function regionalization, management officials put the original Yellow River dams, management stations and other common infrastructure and even the sole road into the core zone into the buffer zone. This resulted in oil production vehicles, personnel and protected area patrol inspectors having to regularly access the core area, but they could not do this and comply with the regulations to protect the management of the nature reserve, and they were also contradictory to flood and other relevant laws and regulations.

At the same time, due to changes in the estuary region of the Yellow River, a large amount of new land was formed by sediment carried by the Yellow River every year, and these new areas are located in the confluence of the river and the sea and are eco-tones of marine ecosystems and terrestrial ecosystems, many of which are important habitats for rare and endangered birds. However, because the functional divisions are not clear, strict partition management cannot be implemented, so we need to clarify the functional areas in order to better implement protection and management.

In 2010, the management of the National Nature Reserve in the Yellow River Delta submitted adjustment proposals.

5. Management suggestions

To address the current problems of the Yellow River Delta Reserve, the protected area should implement the following:

1) The National Nature Reserve's management should enhance publicity and investment, improve the social and economic status of the area, expand the domestic and international impact and visibility of the protected area, and apply for China to be included in the Important International Wetland Directory as soon as possible.

2) The management of the National Nature Reserve should also coordinate the balance between protection and exploitation, particularly issues involving oil field development and construction in a protected area, and the relationship between agricultural land reclamation around the protected area and the protection of the protected area. Oil field development should have rare and endangered bird protection as a precondition.

3) The core area of the protected area should prohibit all human sabotage, and management should take effective protective measures to protect rare and endangered wildlife and their habitats.

4) National Nature Reserve management should increase environmental publicity and education, to improve the quality of life of local residents as well as bird protection awareness, and to lay a solid social foundation for the stable long-term development of the protected area.

Acknowledgements

This study was financially supported by the National Natural Science Foundation (No.41071330) and The Scientific Research Foundation of Beijing Normal University (No.2009SD-24).

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